

Modulation of the Seasonal Cycle in the Earth's Atmospheric, Oceanic, and Mantle Angular Momentum

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Global warming, by definition, changes the atmospheric temperature field. Since this temperature change is not expected to occur uniformly, either geographically, or with height in the atmosphere, changes can be expected in the pole-to-equator temperature gradient which, by the thermal wind equation, will cause changes in the atmospheric zonal wind field and hence in the wind-driven axial component of the atmospheric angular momentum (AAM). Since length-of-day (LOD) changes are known to be largely caused by changes in the angular momentum of the atmospheric winds, concomitant changes in LOD can also be expected to occur. On interannual time scales numerous studies have shown that AAM and LOD variations are correlated with the Southern Oscillation Index (SOI). Here, observed changes in the strengths of the annual and semiannual AAM and LOD signals are analyzed and are also shown to be significantly correlated with the SOI. This correlation between the SOI and the modulation of the seasonal AAM and LOD signals demonstrates a linkage between seasonal AAM and LOD (and hence seasonal zonal wind) variability and the El Niño / Southern Oscillation (ENSO) phenomenon, a linkage that can only arise through non-linear interactions. Results for the modulation of the seasonal cycle in oceanic angular momentum will also be reported and discussed.